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Emma Marie Schmidt

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Summary

I have recently completed a B.S. in Physics with an emphasis in atmospheric applications. I am experienced in the fields of atmospheric dynamics, shock hydrodynamics, and equations of state. In these applications, my research has focused on using symplectic geometry and Lie group methods to construct analytic solutions for code analysis. My primary computer languages are Python, Mathematica, Maple, and Shell Script.

Employment History

June 2015 – Present
Los Alamos National Laboratory

2015 Under the guidance of two staff mentors, I completed a mesh convergence study in a Lagrangian multiphysics code for shock waves through metals. This project involved comparing calculations done on a high performance computer to analytic baseline solutions created in Python.

2016 Using Lie symmetry properties of the Euler compressible flow equations, I worked for two graduate students and a staff mentor to compute a scale-invariant approximation to the Mie-Gruneisen equation of state. The approximation was constructed in Mathematica, using 3-dimensional fits in phase space with additional conditions from thermodynamic stability.

2017 Under the guidance of a staff mentor, I used symplectic geometry to compute the form of an equation of state with scale-invariant Lie symmetry in a collapsing cavity. I then worked with a graduate student to analyze specific solutions of a scale-invariant collapsing cavity. This is also the year I began tutoring new students in Lie group theory and symplectic geometry.

2018 Under the guidance of a staff mentor, another student and I used the method of weighted residuals to rederive the P_3 approximation of the Boltzmann transport equation. We then used symplectic geometry to study the Lie group invariant properties of the P_3 approximation, and constructed an example translation-invariant solution.

2019 Under a staff mentor, I performed quasi-similar analysis on a converging shock wave with a Mie-Gruneisen equation of state. The converging shock wave is a non-linear eigenvalue problem, and the quasi-similar approach uses both Lie group and perturbation methods to find a solution. On a separate project in data analysis, I wrote several Python scripts for the Fourier analysis of projectile data. I have continued to tutor new students in Lie group theory and symplectic geometry.

Fall 2018 – Spring 2019
New Mexico Institute of Mining and Technology, Department of Physics
Research under Dr. Sharon Sessions. I wrote shell scripts for analyzing the results of simulations of the organization of deep tropical convection. This work is described in my undergraduate capstone report and in a presentation given in the graduate course PHYS 502, *Research and Scientific Communication.*

Fall 2018
New Mexico Institute of Mining and Technology, Department of Physics
Grader, PHYS 333. I created homework solutions and graded weekly assignments for an undergraduate course in electricity and magnetism.

Education

December 2019 New Mexico Institute of Mining and Technology
B.S. in Physics with Atmospheric Physics Option. Cumulative GPA: 3.78.

Service Activities

Spring 2018 – Spring 2019 New Mexico Institute of Mining and Technology
Student Government Association Senator (student body representative).

Spring 2018 New Mexico Institute of Mining and Technology
Peer mentor nominated by the Department of Mathematics, New Mexico Insititute of Mining and Technology.

Professional Societies **Summer 2016 – Present** American Physical Society

Spring 2018 Society of Physics Students

Awards

Spring 2019
Department of Physics, New Mexico Tech: Albert Petscheck Award for Excellence in Theoretical Physics Research.

August 2nd 2018
Los Alamos National Laboratory: Distinguished Student Award

Spring 2018
Department of Physics, New Mexico Tech: Physics Honors Society, Sigma Pi Sigma

Fall 2017
Department of Physics, New Mexico Tech: Tech Scholar

Summer 2016
Los Alamos National Laboratory Student Symposium: Best Poster Presentation Physics Category

Fall 2015
New Mexico Tech: 4-Year Silver Scholarship

Publications

† Pittman, Emily R.; Schmidt, Emma M.; Ramsey, Scott D.; *Symmetries of the P3 Approximation to the Boltzmann Neutron Transport Equation.* In review at the Annals of Nuclear Energy (2019).

† Boyd, Zachary M.; Schmidt, Emma M.; Ramsey, Scott D.; Baty, Roy S.; *Collapsing Cavities and Converging Shocks in Non-Ideal Materials.* Quarterly Journal of Mechanics and Applied Mathematics **72**: 501-520 (2019).

† Ramsey, Scott D.; Schmidt, Emma M.; Boyd, Zachary M.; Lilieholm, Jennifer F.; Baty, Roy S.; *Converging Shock Flows for a Mie-Grüneisen Equation of State.* Physics of Fluids **30**, 046101 (2018). *https://doi.org/10.1063/1.5018323* — **Editor's Pick, April 2018**

Presentations

† Schmidt, Emma M.; *Quasi-Similar Converging Shock Flows for a Mie-Gruneisen Equation of State.* American Physical Society, Division of Fluid Dynamics, November 23-26, 2019. Oral Presentation.

† Schmidt, Emma M.; *The Scaling Group of the 1-D Inviscid Euler Equations.* American Physical Society, Division of Fluid Dynamics, November 19th-21st, 2017. Oral Presentation.

† Schmidt, Emma M.; *A Scale Invariant Equation of State for Gruneisen Materials.* American Physical Society, Division of Fluid Dynamics, November 20th-22nd, 2016. Oral Presentation.

References

Available upon request.